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June 27, 2002

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

RE: IB Docket No. 01-185 EX PARTE PRESENTATION

Flexibility for Delivery of Communications by Mobile-Satellite Service Providers In the 2 GHz Band, the L-Band, and The 1.6/2.4 GHz Band

Dear Ms. Dortch:

On April 1, 2002, AT&T Wireless Services, Inc. ("AT&T") submitted untimely "Further Comments" in response to the Commission Staff's request for technical information on the provision of an "ancillary terrestrial component" ("ATC") by Mobile-Satellite Service ("MSS") systems.[1] On May 13, 2002, Cingular Wireless LLC and Sprint Corporation jointly submitted an untimely letter and technical statement responding to the previously-filed technical analyses of ICO Global Communications (Holdings) Ltd. ("ICO") and Globalstar, L.P. ("GLP"). In addition to being filed after the date set by Staff for filing such comments, the comments and technical statements of AT&T and Cingular/Sprint (collectively, "the Terrestrial Carriers") are riddled with factual and legal errors and distortions regarding integrated MSS-ATC systems.

As the operator of an Above 1 GHz MSS system and a licensee of a 2 GHz MSS system in development, GLP strongly supports the Commission's proposal to grant flexibility to offer ATC to MSS licensees in all available MSS bands. To ensure that the record is clear and accurate, Globalstar is filing this response to the

[1] See Commission Staff Invites Technical Comment on the Certain Proposals to Permit Flexibility in the Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band, DA 02-554 (released Mar. 6, 2002).

Terrestrial Carriers to correct several of the errors and distortions in their submissions.

Specifically, GLP establishes the following principles regarding ATC in this letter and the accompanying Technical Statement:

- An integrated MSS-ATC system can dynamically assign frequencies to satellite and terrestrial calls to maximize spectrum use in ways that cannot be accomplished if ATC is severed from the MSS component. In any event, there are significant technical, economic and practical barriers to successful intrasystem cooperation in a network comprised of independent MSS and ATC providers.

- Dynamic frequency assignment is a system-wide operating principle that permits efficient use of spectrum throughout a service area, not just at the boundary between MSS and ATC use for a single channel.

- Based on the existing Globalstar system, the potential ATC capacity is more than adequate to support construction and operation of an ATC network.

- Co-frequency sharing by Fixed-Satellite Service and Fixed Service licensees at Ku-band and 39 GHz is irrelevant to the issue of frequency sharing between the mobile satellite and mobile terrestrial components in this proceeding.

- The Communications Act does not mandate severance and auction of spectrum used for ATC.

- CDMA air interfaces support dynamic frequency assignment for both satellite and terrestrial calls.

- The request of MSS licensees for ATC authority demonstrates neither that MSS licensees have too much spectrum, nor that they have a desire to offer terrestrial service at the expense of satellite service. Grant of ATC authority will improve the financial standing and spectrum efficiency of MSS systems and will aid rather than impair service to rural and underserved areas.

I. The Terrestrial Carriers incorrectly claim that use of separate channel assignments in the terrestrial and satellite modes of an integrated ATC-MSS system within the same geographic area supports segmentation of the MSS spectrum for unaffiliated terrestrial and satellite service providers.[2]

The Terrestrial Carriers correctly point out that the terrestrial and satellite components of an integrated MSS-ATC system cannot operate co-frequency in the same geographic location. No one disputes that conclusion. However, that conclusion alone does not justify segmenting MSS spectrum bands for separate satellite and terrestrial service providers. Band segmentation would severely impair the available spectrum resources for MSS, and would increase the difficulty of dynamic frequency assignment for MSS-ATC whether offered by one or two service providers.

As GLP demonstrated in its supplemental comments in this proceeding filed March 22, 2002, and in the attached Technical Statement, an integrated MSS-ATC system can assign channels to the satellite and terrestrial modes to achieve efficiencies and maximize spectrum usage that would not be feasible if separate providers were assigned separate band segments. All agree that the channels assigned for ATC cannot be used for the satellite component in the specific geographic areas where the frequencies are in use for ATC. However, outside those areas, even within the same satellite beam, all the frequencies are available for MSS, including the ATC channels. These regions are dynamic in size and shape, as the satellite beams travel across the surface of the earth and across ATC service areas. Dynamic frequency assignment allows the operator to maximize the regions served by the entire MSS band, improving efficiency and capacity. GLP's technique is not "band segmentation," but rather "geographic separation," a technique long used in other wireless services to prevent inter- or intrasystem interference.

Terrestrial carriers use geographic separation in their systems today. In fact, terrestrial carriers do not use all of their licensed spectrum in a specific geographic area. Frequency re-use is utilized so that at one specific location, only a small portion of the licensed spectrum is deployed. This geographic separation for frequency re-use has never been advanced as a rationale to claim that terrestrial spectrum should be severed for separate licensees nor that terrestrial carriers have too much spectrum. Rather, frequency re-use is a standard practice that allows operators to maximize the capacity of the system.

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[2] See AT&T Further Comments, at 2-3; Cingular/Sprint Letter, at 7-8.

The Terrestrial Carriers chose to ignore not only the geographic separation principle that is integral to their own systems, but also several other key points in their analyses of an integrated MSS-ATC system. For example, the beams of non-geostationary ("NGSO") satellites are constantly in motion. There are always regions where there are overlapping Globalstar beams. There are always times of the day when there are two or more overlapping beams; however, each beam could have one or more ATC service areas in it that are not in common with other overlapping beams. In this case, Globalstar can assign different ATC channels for the two overlapping beams, and the overlap region will be served by all the available MSS spectrum. For that overlap region, the efficiency and capacity of MSS increases. Obviously, tracking the beam patterns and assigning channels to ATC versus MSS to achieve these efficiencies becomes extremely complex. The MSS operator is the only entity with the requisite system software and the expertise and incentive to manage the channel assignment process.

Globalstar can also use for MSS those channels assigned to ATC outside the geographic areas where interference would occur. As demonstrated in the attached Technical Statement, co-channel sharing can occur even within the same beam. Based on the Globalstar system architecture, there is an identifiable amount of interference from simultaneous calls on a single channel that can be allocated to either MSS calls or ATC calls. Severing MSS and ATC operations would eliminate the capability to make use of this dynamic interference allocation to improve spectrum efficiency.

Segmenting the band would take some number of channels away from MSS operators *everywhere*, and would potentially cripple MSS service in those areas where it is not economically feasible to build the terrestrial infrastructure. Segmenting the band would also make virtually impossible the type of coordination necessary to maximize use of the spectrum.

The Terrestrial Carriers have advocated their simplistic conclusion that the inability of two mobile services to operate co-frequency in the same geographic location *requires* the creation of a separate terrestrial service solely for one reason: They want the Commission to take spectrum away from MSS rather than to augment the services available over MSS frequencies as contemplated by Section 303(y) of the Communications Act of 1934, as amended. That is contrary to the goal of this proceeding and the public interest in maximizing spectrum efficiency and capacity, for the many reasons submitted to the record by GLP, ICO, MSV, and other supporters of ATC.

It is also contrary to how the Commission treats other wireless services. The spectrum resource allocation demanded by an integrated MSS-ATC system is similar to, although more complex than, a terrestrial carrier's use of separate channels for analog and digital service in the same geographic location. In both cases, the spectrum licensees must decide how to allot their assigned spectrum to maximize capacity and to use the spectrum efficiently so that they can best serve their intended markets and achieve a return on their investment in the wireless facilities. Just as there are no plans to disaggregate a cellular carrier's frequencies simply because they are used for digital service, there is no reason to sever an MSS carrier's frequencies used for ATC and award them to another licensee.

II. Cingular and Sprint are incorrect in claiming that ATC capacity is severely limited by intrasystem interference.[3]

The analysis submitted by Cingular and Sprint claims that intrasystem interference would limit ATC capacity on the Globalstar system so severely that the traffic volumes could not justify construction and operation of ATC networks.

As explained in the Technical Statement, this conclusion is based on a flawed analysis and is completely unjustified. The Telcordia Analysis makes four serious errors. First, it erroneously assumes that all ATC terminals are in clear line of sight to the satellite. The purpose of ATC is to allow use of terminals indoors and in urban canyons where line of sight is not available. Second, the Telcordia Analysis incorrectly assumes that all ATC terminals are transmitting at maximum power (100 mW). All digital cellular systems use power control, and so would ATC. As a result, the average transmit power is 10 mW.

Third, the Telcordia Analysis incorrectly assumes that MSS and ATC use the same polarization. Like cellular, an ATC mobile unit would use linear polarization; MSS uses circular. This polarization mismatch results in polarization loss toward the satellite antenna. Fourth, the Telcordia Analysis makes the erroneous assumption that MSS and ATC use the same antenna patterns. Terrestrial antenna patterns attempt to maximize gain out to the horizon, while MSS patterns attempt to maximize gain toward the satellite and minimize gain toward the horizon. As a result of its flawed assumptions, the Telcordia Analysis mischaracterizes ATC and the potential capacity of an ATC system.

Using the correct parameters, the Technical Statement demonstrates that the capacity of an ATC network could be substantial. On the existing Globalstar MSS Above 1 GHz system, each 1.23 MHz channel is reused in each beam, and each channel will support about 60 simultaneous MSS calls. Taking into consideration

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[3] See Cingular/Sprint Letter, at 2-3

the differences in technical parameters between MSS and ATC, one 1.23 MHz channel would support about 490 ATC calls for each MSS call. Thus, one channel can support 29,400 simultaneous ATC calls if it is dedicated to ATC service. The average number of beams over the continental United States which would have a single MSS channel dedicated to ATC is four; therefore, there could be 117,600 simultaneous ATC callers in the Continental U.S. (CONUS), based on the eleven ATC service areas proposed by GLP in its March 22, 2002 supplemental comments. That figure translates to 3.9 million subscribers authorized for ATC in CONUS, which is more than sufficient to make ATC a viable business niche for an MSS operator.

III. AT&T incorrectly claims that the existence of unaffiliated satellite and terrestrial licensees in Fixed Satellite Service bands demonstrates the feasibility of licensing unaffiliated terrestrial and satellite service providers in the MSS bands.[4]

AT&T cites the Commission's decisions to auction spectrum for terrestrial services in the Ku-band and 39 GHz band as precedent for its claim that the MSS bands can support segmented terrestrial and satellite licenses. Obviously, the mere fact that the Commission has used auctions to award licenses for terrestrial services in bands shared with the Fixed Satellite Service ("FSS") does not justify band segmentation of MSS bands. AT&T disingenuously, in GLP's opinion, ignores the facts of those proceedings in order to make a rhetorical point that is ultimately irrelevant in this proceeding.

First, in the Ku-band and certain bands at 39 GHz, unaffiliated FSS and terrestrial operators may be licensed co-frequency.[5] Yet, AT&T has already conceded, and its technical appendix concludes, that satellite and terrestrial operators <u>cannot</u> operate co-frequency in the MSS bands.

Second, the satellite services sharing with terrestrial services at Ku-band and 39 GHz are *fixed satellite services*. The systems in these bands are stationary and

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[4] <u>See</u> <u>AT&T Further Comments</u>, at 3.

[5] <u>See</u> <u>Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range</u>, FCC 02-116 (released May 23, 2002); <u>Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands</u>, FCC 01-182 (released May 31, 2001).

use highly directional antennas, a situation where the standard coordination of two separate services is feasible. On the other hand, both MSS and ATC callers would be mobile using phones with omnidirectional antennas. Whatever capability the FSS has to share with terrestrial services is irrelevant to determining the capability of a *mobile* satellite service to share with a *mobile* terrestrial service. AT&T's attempt to use the Ku-band and 39 GHz proceedings as support misrepresents the facts and circumstances present in those proceedings in order to apply them to ATC in the MSS bands.[6]

IV. The Terrestrial Carriers incorrectly claim that there is no technical obstacle to cooperation between unaffiliated MSS providers and ATC providers to offer subscribers an integrated satellite/terrestrial service.[7]

The Terrestrial Carriers argue that the need for close coordination between the terrestrial and satellite components of an integrated MSS-ATC does not preclude the licensing of separate operators for the satellite and terrestrial components. The Terrestrial Carriers cannot possibly be as naïve as their argument implies.

Under GLP's proposal for integrating MSS and ATC, there would be *no* group of frequencies specifically set aside for ATC in all geographic locations. A relatively small number of metropolitan areas would be selected for ATC service. Each of those areas would have one of two or three different sets of frequencies available for ATC. The availability of frequencies for ATC at any given time in those areas would depend on the beam patterns created by the existing satellite constellation, the terrestrial traffic at that site and the needs of the satellite component that might be affected by terrestrial service.

As the Telcordia Analysis points out, at any given time, there will be a maximum allowable number of ATC users because of the potential for interference into MSS. The maximum number would have to be enforced regardless of which entity was operating the terrestrial service.

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6 One party, Iridium Satellite LLC, has suggested that the Commission license ATC separately, but co-frequency, as a service secondary to MSS. Comments of Iridium Satellite LLC, at 5-8 (Oct. 22, 2001). However, there is no evidence in the record that demonstrates the technical feasibility of such an approach. Indeed, the only technical evidence in the record demonstrates that such an approach will not work.

7 AT&T Further Comments, at 4; Cingular/Sprint Letter, at 10.

It is not at all clear how such terrestrial "rights" would be licensed. But, it is absurd to suggest that a service provider whose interests are diametrically opposed to those of the MSS provider would somehow "coordinate" to use some or none of its spectrum for terrestrial service, and cap the number of allowable users, depending upon the needs of the satellite component. In fact, if, as Cingular/Sprint's technical analysis claims, the use of an increasing number of terrestrial terminals increases the degradation to MSS service no matter what frequencies are set aside for ATC, then the MSS licensee would be at the mercy of the terrestrial licensee not to extend its service to a point of degrading the satellite component.[8]

Even more troubling for the satellite operator would be a situation where there were multiple ATC licensees in different regions of the U.S., demanding spectrum resources at odds with each other *and* the MSS operator. The Terrestrial Carriers have never attempted to explain how multiple terrestrial service operators, licensed by geographic regions, could coordinate with, for example, the eight MSS licensees at 2 GHz to provide a unified, dual-mode service, using the limited spectrum resources in that band.

From the independent operator's perspective, such a separate ATC service coupled with an MSS component would be unmarketable. The independent ATC operator would have no incentive to characterize the service as the terrestrial component of a satellite phone service but rather would have an irresistible incentive to market ATC as a standard cellular or PCS offering.

The economics of an independent ATC service suggest that, if licensed for ATC, the Terrestrial Carriers would not closely coordinate with an MSS carrier. In fact, the Terrestrial Carriers' efforts to discredit ICO's and GLP's technical studies provide further evidence that they have no intention of coordinating with satellite carriers. Their suggestion that completely separate licensees could or would coordinate ATC and MSS lacks credibility.

V. The Terrestrial Carriers incorrectly claim that band segmentation is feasible for delivery of ATC, and so, the Communications Act mandates severance and auctions of ATC spectrum.[9]

Section 309(j) of the Act does not dictate how spectrum should be allocated or used. It merely states that when the Commission has received mutually-exclusive applications for initial licenses in certain wireless services, it shall determine the

[8] See Telcordia Analysis, at 70-72.

[9] AT&T Further Comments, at 5; Cingular/Sprint Letter, at 15-16.

licensee by auction. In fact, Section 309(j)(6)(A) states clearly that the competitive bidding statute shall not be used to "alter spectrum allocation criteria and procedures established by the other provisions of this Act." Also, Section 309(j)(7) states that the Commission may not use the expectation of revenues from auctions in determining the use of spectrum or the public interest under other sections of the Act. Adoption of the Terrestrial Carriers' suggestion that band segmentation is required under Section 309(j) would represent an unlawful use of the Commission's auction authority, because it would allow an allocation/licensing decision to be driven by the use of auctions, which Section 309(j) forbids.

VI. AT&T incorrectly claims that the record is devoid of technical showings on dynamic channel management between satellite and terrestrial modes.[10]

On March 22, 2002, GLP filed an extensive technical demonstration of how an integrated MSS-ATC system can use dynamic channel management to achieve spectrum efficiencies and capacity that cannot be achieved by two separate satellite and terrestrial systems. AT&T waited to analyze GLP's timely-filed technical demonstration in order to frame its own untimely analysis as a rebuttal. As it turns out, AT&T's Technical Appendix actually *agrees* with the conclusions reached in GLP's document notwithstanding AT&T's arguments in its pleading.[11]

VII. Cingular/Sprint incorrectly claim that the CDMA air interface will not support dynamic frequency assignment.[12]

As explained in the Technical Statement, the specifications for each of IS-95, cdma2000, QUALCOMM HDR, and the Globalstar Air Interface standards provide for "hard hand-offs" of CDMA calls. Hard hand-offs are implemented today in IS-95 systems, and there would be no bar to such hand-offs in ATC.

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[10] AT&T Further Comments, at 6.

[11] See Comsearch Technical Appendix, at 1 ("Additionally, technically, a hybrid satellite/terrestrial service that provides urban area and in-building coverage as well as ubiquitous satellite coverage could be designed.").

[12] Cingular/Sprint Letter, at 6.

VIII. AT&T incorrectly claims that the terrestrial mode would become the dominant service in MSS frequencies and MSS operators would not bother to offer a satellite service.[13]

Some very basic facts about satellite services demonstrate that this hyperbolic assertion cannot be true. First, no rational MSS licensee will invest the several billion dollars required to construct, launch and operate a satellite system that will not be used for its intended purpose. Second, the Commission's Rules *require* that MSS systems provide coverage for satellite service throughout the United States.[14]

Third, an MSS system, such as Globalstar™, provides *global* services, one important feature of which is global roaming. When foreign subscribers come to U.S. land or marine territory, they must be able to use their Globalstar phones in the satellite mode.

Fourth, no rational MSS operator will attempt to become the fourth, fifth, sixth or seventh cellular/PCS operator in large urban areas. Globalstar intends to serve a variety of niche markets. One of those niche markets may very well be subscribers who would like the convenience of one number, one monthly invoice for a service that can readily be used in both urban and rural areas, indeed, anywhere. To such subscribers, the relatively higher cost and larger size of the handset for such a service may be offset by the convenience of ubiquitous coverage, which is not obtainable using cellular/PCS phones. Another niche market may be public safety organizations that have to serve urban and rural areas and need one phone that can operate in both. Serving these niche markets will never cause ATC to dominate the satellite service nor be cause to abandon the satellite service.

Fifth, ATC will always have to be an ancillary service for Globalstar subscribers. There will be a finite number of simultaneous ATC users in the continental United States. Accordingly, there will be an optimal distribution of frequencies for ATC so as to maximize the number of ATC calls in ATC areas *and* MSS capacity in rural and maritime areas. This is a marketing and business issue which is best managed by the MSS operator who understands and can predict the dynamic demands of the system.

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[13] AT&T Further Comments, at 7.

[14] See 47 C.F.R. § 25.143(b)(2).

IX. AT&T incorrectly claims that the need for geographic separation between the terrestrial and satellite components (for co-frequency operation) makes dynamic frequency assignment useless and "beneficial only (if at all) in the rare situation when customers are accessible via either the terrestrial or satellite frequencies, which likely will be limited to those comparatively few customers living between urban/suburban and rural areas."[15]

AT&T's assessment of the value of dynamic frequency assignment is premised on erroneous calculations of the interference between the two components. As indicated in the attached Technical Statement, AT&T's analysis misrepresents the degree of interference between the satellite and terrestrial components and substantially overestimates the geographic separation required for reuse of the same channel by terrestrial and satellite component users in an integrated MSS-ATC system. In fact, as indicated herein, the satellite component can use frequencies assigned for ATC in certain locations in relatively close proximity.

The ability of the satellite component to use the channels assigned to ATC outside the ATC service areas allows the operator of the system to recapture substantial capacity for MSS because of the shifting satellite beam patterns on the service of the earth as described in GLP's March 22, 2002, "Response to Public Notice DA 02-554." Channels assigned to ATC can be used for MSS approximately seven kilometers from an ATC base station. That increases the capacity of the satellite component in the areas where it is needed, and maximizes efficient use of the frequencies.

AT&T is also wrong in assuming that the satellite component will not be used in urban/suburban areas. Because ATC will be implemented in the United States, at least initially, Globalstar subscribers from other countries roaming into the United States will require satellite component service in all parts of the U.S., including ATC service areas. Public safety organizations generally will prefer the satellite component service because it is not dependent on ground-based communications systems which are more easily disrupted in natural or manmade disasters. Accordingly, the Globalstar system will always have satellite service available throughout the United States.

Moreover, the operator of an integrated MSS-ATC system will be able to shift resources to improve capacity in "hot spots." Terrestrial coverage is usually tailored to anticipated capacity; when emergencies or other events generate an increased

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[15] AT&T Further Comments, at 7; see Comsearch Technical Appendix, at 3.

demand, the satellite component can provide additional capacity. Finally, the satellite component will provide coverage where there are holes in the terrestrial coverage or temporary shutdowns of terrestrial facilities due to technical problems or other disruptions.

X. Cingular/Sprint conclude erroneously that the ATC proposal demonstrates that MSS has too much spectrum.[16]

Based on their analysis of ATC, Cingular and Sprint conclude that ATC will reduce the amount of MSS spectrum available for MSS, and so, MSS licensees have access to more spectrum for MSS than they need. Cingular/Sprint's superficial conclusion shows a disturbing disregard for the very important issues in this proceeding concerning the Commission's spectrum management policies.

The first response to Cingular/Sprint must be to ask whether the Commission reviewed the loading of cellular or PCS frequencies two years after commercial service commenced to decide whether these services had more spectrum than they needed? Or, whether the Commission should review the loading of cellular and PCS frequencies in rural areas to determine whether those frequencies should be taken away from the current licensees for not having any subscribers?

The Commission has never applied a loading-based test to newly deployed services, and it would be arbitrary and capricious to start with MSS. In the PCS service, a licensee can retain its authorized spectrum if it has constructed facilities to provide an adequate signal to a certain percentage of the population in its service area, irrespective of whether it actually has subscribers.[17]

In the first five years of subscriber statistics (1985-1990) compiled by CTIA, the cellular industry achieved about a 2 percent penetration rate.[18] It was not until a change in the market's perception of the uses for mobile phones and the falling price of service that cellular subscribership rose rapidly. Yet, the Commission did not propose to reallocate cellular spectrum while the cellular frequencies were not fully loaded. On the contrary, the Commission allocated more spectrum for cellular

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[16] Cingular/Sprint Letter, at 15.

[17] See 47 C.F.R. § 24.203.

[18] Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, 16 FCC Rcd 13350, App. C--Table 1 (2001).

carriers well before cellular's relatively recent growth spurt.[19] Even today, when vast areas of rural America are not even served by cellular, much less by fully-loaded channels, the Commission has not proposed to take away the frequencies and allocate them to a service that might use them.

MMDS is another prime example of a wireless service with many unused megahertz. Indeed, 20 years after 60 MHz were allocated for MMDS, that service continues not to show substantial use of the spectrum.[20] Rather than taking the spectrum away from MMDS, the Commission offered MMDS licensees the flexibility to expand their service opportunities by adopting rules to permit them to provide two-way fixed, telecommunications services.[21] In light of the Commission's long history of recognizing that new services need time to develop and gain acceptance in the marketplace, it would be arbitrary and capricious for the Commission to take spectrum from MSS for unaffiliated ATC providers, rather than granting flexibility to offer ATC.

In any event, the fact that any one MSS provider could make spectrum available for ATC is irrelevant to the question of the need for MSS spectrum. When the Commission allocates spectrum for a specific service, such as MSS, it considers a number of factors, including the public interest benefits in the allocation and the articulated need for the spectrum from many sources over several years.[22] The number of current MSS subscribers does not reflect the number of persons living in the United States without telephone service, nor does it reflect the number of lives that could be saved as long as there are adequate satellite communications facilities following a disaster.

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[19] See Amendment of Parts 2 and 22 of the Commission's Rules Relative to the Cellular Communications Service, 2 FCC Rcd 1825 (1986).

[20] See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, 17 FCC Rcd 1244, ¶ 71 (2002) (reporting that with 36 million homes actually capable of receiving an MMDS signal, there are about 700,000 MMDS subscribers).

[21] See Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two Way Transmissions, 13 FCC Rcd 19112 (1998).

[22] See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, 12 FCC Rcd 7388 (1997), on recon., 13 FCC Rcd 23949 (1998).

Granting MSS systems the flexibility to provide ATC will significantly enhance the economic viability of these systems and enhance their availability to rural and underserved areas and public safety organizations. Economic stability ensures that satellite services will be available to those people and in those areas that are not now and will never be covered by terrestrial systems -- not only in the U.S. but worldwide. On the other hand, by segmenting MSS spectrum or authorizing an unaffiliated person to use the MSS spectrum for terrestrial services, the Commission would undermine the viability of the MSS business in the U.S., but would not improve the lot of rural and underserved areas or public safety organizations.

By increasing the potential market and financial base for MSS, ATC will ultimately serve the public interest by making MSS more useful to its core subscriber populations in rural and underserved areas, and filling the need on which the allocations for MSS are based.

Pursuant to Section 1.1206(b)(1) of the Commission's Rules, this letter and the enclosure are being filed electronically over the Commission's Electronic Comment Filing System. Should there be any questions, please contact the undersigned.

Respectfully submitted,

GLOBALSTAR, L.P.

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TECHNICAL STATEMENT

This Technical Statement, submitted by Globalstar, L.P., responds to the two analyses of the use of Mobile-Satellite Service frequencies for terrestrial mobile services submitted to IB Docket No. 01-185 by AT&T Wireless, Inc. and jointly by Cingular Wireless LLC and Sprint Corporation.

I. Response to the Technical Appendix to the Further Comments of AT&T Wireless Services on Flexibility for Delivery of Communications by Mobile Satellite Service Providers - Interference analysis of an MSS ATC system

In its Comments on Public Notice of 6 March 2002 on IB Docket No. 01-185 "Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band and the 1.6/2.4 GHz Bands," AT&T Wireless Services, Inc. presented an analysis of interference between the terrestrial and satellite components of a MSS Ancillary Terrestrial Component (ATC) system. Essentially, AT&T concluded that the satellite and terrestrial modes cannot operate co-frequency and that huge separation distances would be required between satellite component equipment and terrestrial component equipment in order to avoid interference. AT&T is correct that the satellite and terrestrial modes cannot operate co-frequency in the same geographic location.[1] However, as discussed further below, AT&T's analysis is otherwise flawed and misrepresents the interference environment that would be encountered in ATC operation. This Technical Statement addresses the interference scenarios from the satellite component into the terrestrial component (i.e. Scenarios 1 and 2 in the AT&T analysis).

AT&T's analysis includes two erroneous assumptions that result in erroneous conclusions. First, the values for the interference thresholds for cdma2000 were taken from the FCC Interim Report of the "Spectrum Study of the 2500-2690 MHz Band" rather than the Final Report dated in March 2001. The correct values are used in the attached tables. The older threshold interference level used by Comsearch leads to incorrect conclusions regarding ATC.

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[1] See Comsearch Technical Appendix, at 2-3.

Second, throughout its analysis, AT&T assumes that the loss incurred by the signals is equivalent to that incurred by a signal traveling in "free space," so-called free space loss. This is an unrealistic assumption for mobile service signals, whether for terrestrial or satellite. The free space loss assumption implies that the signals are attenuated proportional to the square of the distance separating the transmitter and the receiver. Current literature indicates that terrestrial mobile signals are attenuated proportional to a factor somewhere between the third and fourth power of the distance between the transmitter and the receiver.[2] The FCC itself recognizes the inaccuracy of free space loss assumptions, and uses the Longley-Rice attenuation model, developed by NTIA, in Part 24 of its Rules, which governs PCS.[3]

The following discussion and attached tables use the "Hata" model to calculate the required separation distances to avoid interference. The "Hata" model, which is given in ITU-R Recommendation P529-3, is used to model propagation of terrestrial mobile signals. The Hata model indicates that mobile signals are attenuated in proportion to the distance between the transmitter and the receiver raised to the 3.4 power. The Longley-Rice model predicts attenuation values similar to the Hata model but consistently greater; thus, the Hata model is more conservative in predicting interference. Further, the Hata model is recognized as depicting typical propagation loss for terrestrial "cellular" systems in dense urban areas.[4] Since the terrestrial mode of ATC will most likely be used in urban areas, Globalstar has used the Hata model in its interference analyses.

Interference From Satellite Terminals To ATC Units And Base Stations. Scenario 1 involves interference from the mobile terminal in the Satellite Component (SC) mode into an ATC base receiving from an ATC unit. The updated interference levels, based on the Final Report, for this

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[2] Pahlavan, K. & Levesque, A.H., Wireless Information Networks, John Wiley & Sons, Inc., New York, 1995, Chapter 4.

[3] 24 C.F.R. Subpart E, App. I.

[4] International Telecommunication Union, Radiocommunication Sector, "Prediction Methods for Terrestrial Land Mobile Service in the VHF and UHF Bands " Recommendation P.529-3, 1999, Geneva.

scenario have been highlighted in Table 1. AT&T uses free space loss to calculate the clear distance from the SC mobile. The "clear" distance is the separation between the transmitter and the receiver required to avoid interference. Figure 1 shows the received signal level as a function of distance from the ATC base station for the ICO Global Communications terminal and the Globalstar terminal using the Hata model. According to Globalstar's analysis, the ICO terminal's distance to clear is 10 km using the Hata model rather than 7735 km using free space propagation, as shown in the AT&T analysis. For a Globalstar vehicular terminal the distance to clear is 7 km using the Hata model.

As a result, Globalstar will be able to operate terminals in satellite mode less than 10 km from ATC base stations and terminals operating in ATC mode, even if both the ATC and satellite terminals are operating on the same channel. At such distances, Globalstar will be able to use channels for MSS service that are being used for ATC service without concern about terrestrial interference between the MSS terminals and the nearby ATC operations. AT&T's free space loss analysis incorrectly suggested that interference concerns would prevent such geographically adjacent spectrum reuse between MSS and ATC operations.

Interference From Satellite Into ATC Units. Scenario 2 involves interference from the satellite downlink into a mobile unit receiving from the ATC base station. The updated interference levels, based on the Final Report, for this scenario have been highlighted in Table 2. Table 2 shows the clear distance for the ICO satellite downlink as well as the Globalstar satellite downlink. Once again, AT&T concluded that a single satellite downlink would interfere with the ATC unit based on the interference thresholds from the Interim Report. The Globalstar analysis shows that a single CDMA satellite downlink channel serving 62 satellite users does not interfere with an ATC unit. Because approximately 62 users is the maximum single channel capacity of the beam, there is no circumstance under which satellite transmissions will interfere with the ATC unit.

Moreover, as reflected by the calculations for ICO and Globalstar, this analysis applies to both the 1.6/2.4 GHz MSS bands which Globalstar is currently using, and the 2 GHz bands, in which Globalstar and ICO plan to operate.

Conclusion. Based on the analysis shown above, it is apparent that the AT&T analysis greatly over estimated the separation distances required to prevent interference between terrestrial component ATC base stations and mobile units. The situation is manageable so that the satellite operator can readily make available to the satellite component spectrum that is used for ATC in specific geographic areas.

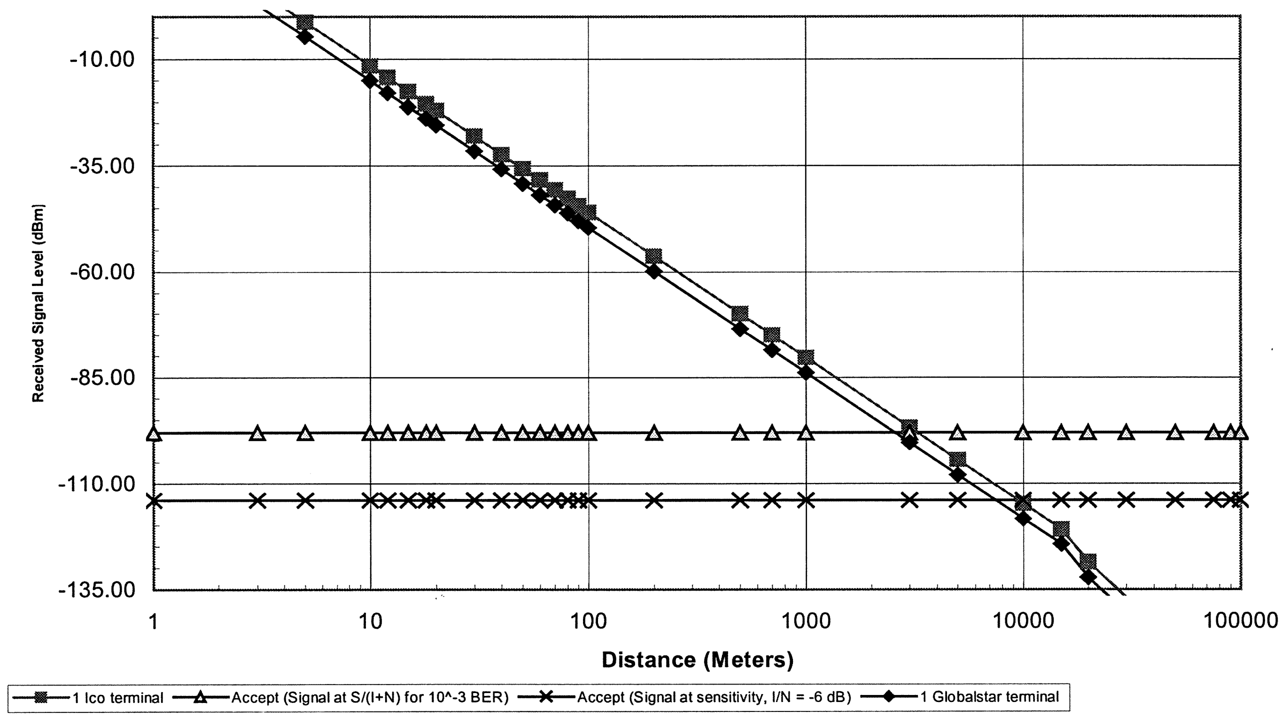
TABLE 1

Link Analysis					
Wanted Carrier	***ATC Base Receiving from ATC Mobile - Scenario 1***				
Wanted Carrier Level	-141	dBW			
Required Eb/No	6.6	dB			
Interference Threshold	-144	dBW			
Required I/N	6	dB			
Antenna Gain	17	dBi			
Interfering Carrier	***SC Mobile to Satellite***				
	Ico Mobile		*Globalstar mobile*		
Frequency	*2185*	MHz	*Frequency*	1613.8	MHz
Interfering Power	7	dBW	Interfering Power	0	dBW
Interfering Gain	0	dBi	Interfering Gain	-3	dBi
OH Loss Required to Clear	-168	dB	OH Loss Required to Clear	-158	dB
Interfering Carrier Level	**-144**	dBW	Interfering Carrier Level	**-144**	dBW
Interfering Carrier Level - used by AT&T	***-153***	*dBW*	*Interfering Carrier Level - used by AT&T*	***-153***	*dBW*
Distance to Clear Case - Hata Model	10.00	km	Distance to Clear Case - Hata Model	7.00	km
AT&T Distance to clear - free space	7735	*km*			

TABLE 2

Link Analysis					
Wanted Carrier	***ATC Mobile Receiving from ATC Base - Scenario 2***				
Wanted Carrier Level	-137	dBW			
Required Eb/No	6.6	dB			
Interference Threshold	-140	dBW			
Interference Threshold - AT&T	-149	dBW			
Required I/N	6	dB			
Antenna Gain	0	dBi			
Interfering Carrier Satellite Downlink	***Satellite to Sc Mobile***				
	Ico Satellite		*Globalstar Satellite*		
Frequency	2185	MHz	Frequency	2483.5	MHz
Interfering Power	0.6	dBW	Interfering Power	6.4	dBW
Interfering Gain	33	dBi	Interfering Gain	15	dBi
OH Loss Required to Clear	-173.6	dB	OH Loss Required to Clear	-161.4	dB
Interfering Carrier Level	**-140**	dBW	Interfering Carrier Level	**-140**	dBW
Interfering Carrier Level - used by AT&T	***-149***	*dBW*	*Interfering Carrier Level - used by AT&T*	***-149***	*dBW*
Distance In km for Ico	5224.55	km	Dist. In km for Globalstar	1128.33	km
Result: Single satellite downlink does not interfere with the ATC mobile					

Figure 1 Received Signal Level at ATC Base Station Receiver from MSS Terminal transmitter as a Function of Distance from the Base Station (Hata Model)



II. Response to the "Analysis of Spectrum Sharing Between MSS and Terrestrial Wireless Systems" Submitted by Cingular Wireless LLC and Sprint Corporation

ATC To MSS Interference - Capacity Issue. Based on the Telcordia Analysis,[5] Cingular Wireless LLC and Sprint Corporation (the "Terrestrial Carriers") have argued that an MSS system, such as Globalstar, cannot feasibly deploy ATC capacity, primarily because of the limitations of the MSS return link (the link from the mobile station to the satellite or ATC base station). All filings submitted in IB Docket No. 01-185 to date (except the mistake-ridden AT&T Wireless filing) state that the forward link (satellite or base station to mobile station) interference can be managed. In the following discussion, we explain why the Telcordia Analysis is incorrect in its assessment of the MSS return link limitation. With Globalstar, L.P. ("GLP") as the integrated MSS/ATC operator, the Globalstar system can theoretically serve some 3.9 million ATC subscribers[6] in selected ATC service areas within the Continental United States (CONUS) by dedicating a single channel in specific satellite beams to ATC service.

The Telcordia Analysis examines co-channel sharing between the MSS and ATC components. To determine the average number of simultaneous ATC phone calls that can share a channel with Globalstar MSS phone calls, six factors need to be taken into consideration:

1. The difference in the average EIRP between a MSS mobile station and an ATC mobile station
2. The polarization difference between a MSS mobile station and an ATC mobile station
3. The antenna directivity differences between a MSS mobile station and an ATC mobile station
4. The difference in propagation losses to the MSS satellite between a MSS mobile station and an ATC mobile unit

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5 "Analysis of Spectrum Sharing Between MSS and Terrestrial Wireless Services," by Dr. Jay Padgett, Senior Research Scientist, Telcordia Technologies (May 10, 2002) ("Telcordia Analysis").

6 Based upon an offered load of 30 milliErlangs from "Cellular Radio - Principles and Design" by R.C.V. Macario, McGraw-Hill, New York, 1993, pp. 200-201.

5. The number of MSS callers Globalstar can support on a single MSS frequency and beam at system capacity
6. The average number of MSS satellite beams illuminating the ATC mobile stations in CONUS

The first four radio link factors (1-4 above) add up to a difference of 26.9 dB (a factor of 490) between the amount of power that a Globalstar mobile earth terminal ("MET") transmits toward a Globalstar satellite and the amount of power that a Globalstar ATC unit would transmit. This means that the interference at the satellite caused by one MSS MET is equivalent to the interference at the satellite from 490 simultaneous ATC units. The last two, which are operational factors (5-6 above), add a factor of 240. Combining these factors results in a simultaneous CONUS ATC call capacity of 117,600 (490 X 240 = 117,600). In conjunction with a 30 milliErlang offered load per ATC subscriber, the number of ATC customers served in this scenario is 3.9 million (117,600 X 1 ÷ 0.030 = 3,920,000). A more detailed explanation of these parameters follows.

The average EIRP of the Globalstar MSS MET is 22.4 dBm in the direction of the serving satellite. This power is radiated via a cardioid pattern left hand circular polarization antenna with good polarization purity, oriented in a vertical direction. The average EIRP of an ATC unit is assumed to be 10 dBm in the direction of the ATC base station.[7] This power is radiated via a linearly polarized antenna, oriented in a nominally vertical direction. The difference in EIRP <u>in the intended directions of use</u> is 12.4 dB.

The polarization of the nominally linear ATC antenna is actually elliptical. The polarization may be right hand or left hand sense. The resulting polarization mismatch between the ATC antenna and MSS satellite depends upon the polarization sense of the transmitting and receiving antennas, their respective axial ratios, and the relative tilt angle between the polarization ellipse planes. Statistically, a group of ATC callers will have an average polarization loss to the left hand circular polarization satellite antenna of 3 dB.

[7] The CDMA Developers Group validates various parameters through the users group. The average power from an IS-95 MS is 10 dBm. See: www.cdg.org.

Given the nominal positioning of the ATC unit antenna and its radiation pattern, there will be a gain pattern roll-off with increasing elevations, with a null at zenith. In contrast, the Globalstar MSS MET antennas are designed with a cardioid pattern to enhance gain in the upper hemisphere and minimize gain at the horizon. Globalstar conservatively estimates a 1 dB reduction in gain of the ATC antenna gain in the direction of the satellites, as opposed to the antenna gain in the direction of the ATC base station.

The nominal propagation environment of the MSS caller is fundamentally line-of-sight, whereas the propagation from the nominal ATC caller to the satellite will experience degradation due to the terrain and artificial structures. Globalstar uses the "Hata" model, described in ITU-R Recommendation P529-3, to obtain an average propagation environment attenuation factor of 10.5 dB. This 10.5 dB is the average propagation loss from an active ATC unit to the satellite.

Summing the radio link terms above: the EIRP difference, polarization mismatch, antenna gain roll off, and propagation loss we obtain 26.9 dB (12.4 + 3 + 1 + 10.5 = 26.9 dB). Again, at the satellite this factor equates the interference of 490 simultaneous ATC callers to that of a single MSS caller.

The capacity of each Globalstar MSS return link satellite beam is approximately 60 MSS callers per 1.23 MHz channel. This capacity estimate takes into consideration interference from all callers in adjacent beams and adjacent channels, each beam and frequency with the same 60-caller loading. If Globalstar were to trade the capacity of a single MSS channel, or a portion thereof, in a single MSS beam for ATC usage, we can calculate the degree to which MSS capacity would be degraded in the beam covering the ATC site. By allowing only a portion of the capacity to be used for ATC, there is no degradation to the adjacent MSS beams and channels.

If a single channel within a beam were to be dedicated to ATC, each of the 60 MSS callers could be replaced by 29,400 simultaneous ATC callers (60 X 490 = 29,400). With this level of interference from ATC units, all other Globalstar beams and channels (*i.e.*, in-beam/adjacent channel and other-beam/all channels) would retain their full MSS capacity. In other words, the interference from the 29,400 ATC callers in a specific channel in a beam would have **no** impact on the system's MSS capacity. The ATC units would not cause any more interference in adjacent channels or adjacent beams than if the channel were occupied by the 60 MSS callers that the channel was designed to support.

To extrapolate from one beam to potential simultaneous capacity over CONUS, the number of beams over the specified ATC sites needs to be considered. In the analysis presented in this docket by GLP on March 22, 2002, 11 CONUS cities were illustrated to have the ATC component deployed. Assume that the ATC callers are at a maximum allowable value across CONUS, with no more than 29,400 in any single Globalstar beam. Given the size and dynamics of the Globalstar return link beams over CONUS, the average number of beams which would have a single channel dedicated to ATC is four return link beams. For this scenario, the simultaneous capacity of CONUS ATC callers would therefore be 117,600 (4 X 29,400 = 117,600).

To extend the simultaneous capacity to a number of allowable ATC subscribers, Globalstar uses a cellular model of 30 milliErlangs as a typical offered load per subscriber. In conjunction with the simultaneous capacity, the estimated number of ATC subscribers which could be sustained utilizing a single MSS channel in four MSS beams with the specified distribution of ATC sites is 3.9 million subscribers (117,600 X 1 ÷ 0.030 = 3,920,000).

While supporting this level of ATC usage, Globalstar would maintain that same ATC channel for operation <u>in part</u> for MSS in other beams over CONUS where such beams have fewer than 29,400 ATC callers within them. As stated above, Globalstar would maintain the MSS capacity <u>in full</u> for other beams over CONUS which had no ATC callers in that channel. This is an important point. A single channel in a specific beam can be shared by MSS callers and ATC callers as long as the total interference at the satellite receiver is not greater than the interference of 60 MSS callers from that channel in a single beam. As a result, the operator of an integrated MSS/ATC system will be able to use the MSS spectrum more efficiently than separate MSS and ATC operators using severed channels.

Operational Issues - Integrated MSS/ATC Operations. The advantages of an integrated MSS/ATC system must not be understated. In an integrated MSS/ATC system, the operator's knowledge in real time of the number of terrestrial and MSS callers within current and upcoming beam definitions enables the operator to dynamically allocate MSS and ATC callers on the system, thereby maximizing co-channel sharing as desired or required.

For example, using its knowledge of beam definitions, the operator of an integrated MSS/ATC system could split the ATC and MSS loads between channels as appropriate, to maximize capacity on a specific channel at any given time depending upon the geographic distribution of both MSS and ATC call traffic. For example, the operator could choose to authorize 30 MSS and 14,700 ATC callers on each of two channels within a beam (as opposed to 60 MSS on one and 29,400 ATC on the other channel), or could allocate multiple channels in a beam solely to ATC depending upon demand from each caller segment, time of day and geographical location. Further, the allocation of channels could vary from beam to beam and within a beam over time.

GLP has also examined the effect on the capacity of the adjacent beams and channels if more than 29,400 ATC callers were allocated to a single channel in a beam. Telcordia points out that the L-band beams on the Globalstar satellite are not ideal "boxes", but have a pattern roll off into the adjacent beams.[8] While this is true, Telcordia's conclusions regarding the impact on ATC capacity are not correct.

The power of the immediately adjacent beams is approximately -6 dB with respect to a beam of interest. The roll-off is much greater for non-adjacent beams as most of the overlapping power is at the beam-to-beam interface. As discussed earlier, the capacity of a single channel is 60 MSS callers. If a beam over an ATC site has one channel allocated to 29,400 ATC callers, there would be no effect on the MSS system capacity on co-channel in adjacent beams.

More importantly, Globalstar could elect to add more than 29,400 ATC callers in a specific beam channel with a net loss of adjacent-beam/co-channel MSS capacity attenuated by the 6 dB pattern roll off. Each additional 3.98 ATC callers co-channel in an adjacent beam represent the same power as a single ATC user in a beam (6 dB =

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[8] Telcordia Analysis, at 10.

3.98). Specifically, 117,012 ATC callers in a MSS beam and single channel could be accommodated at the expense of all MSS use in that channel for the adjacent beams (490 ATC users per MSS user X 60 channels X 3.98 adjacent beam power factor = 117,012). If the operator were willing to trade off MSS use in adjacent beams, then many more ATC callers could be accommodated, as the effects to the non-adjacent beams are small. In this way, the operator of an integrated MSS/ATC system can allocate resources to either a spike or steady increase in terrestrial traffic.

Telcordia also claims that adjacent-channel ATC interference would reduce the MSS capacity through adjacent channel "leakage."[9] Current CDMA implementation yields adjacent channel "leakage" at approximately 1.5%. Again, given the 29,400 ATC callers in a single MSS beam and channel, there is no degradation to adjacent-channel co-beam MSS capacity attributable to this interference; the capacity calculation takes into account adjacent channel interference. Given the ratio of received ATC and MSS EIRP and the co-channel leakage, each additional 33,667 ATC callers equates to the loss of 1 adjacent-channel/in-beam MSS caller (490 ATC users per MSS user ÷ 0.015 interference leakage = 33,667). In assigning frequencies, the integrated operator would and could minimize leakage from bands on two sides by careful MSS and ATC channel selection. In any case, adjacent channel interference is <u>not</u> the limiting factor.

It is important to note that because of Globalstar's overlapping satellite beams, the full MSS spectrum will be available for vast portions of CONUS, and particularly in the rural and underserved areas, without regard to how many channels are assigned to ATC in beams covering ATC service areas. As shown in GLP's March 22, 2002, technical comments, a single system operator can devise strategies to dynamically assign different ATC frequencies to ATC sites, thereby allowing even greater areas of rural CONUS to be served by the full MSS spectrum.

To summarize, an integrated MSS/ATC operator can share a channel in a beam between simultaneous MSS calls (M) and ATC calls (A) with no loss of MSS capability in any other beam or channel as long as M + A/490 is equal to or less

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[9] <u>Telcordia Analysis</u>, at 10, 70-71.

than 60. If required, an integrated MSS/ATC operator can assign a complete channel to ATC in a beam covering ATC base stations (29,400 simultaneous calls per beam), and on average, four beams covering ATC stations in CONUS leads to 117,600 simultaneous ATC calls, supporting 3.9 million ATC subscribers. This is achieved with no degradation to MSS service in adjacent channels or adjacent beams.

Also, if required, an integrated MSS/ATC operator can allocate, in real time, all of one channel and part of another channel to ATC in a single beam with no loss of MSS capability in any other beam or channel. Above that, an integrated MSS/ATC operator can overallocate calls, in real time, to a single channel in a beam, with some small loss of MSS capacity in adjacent channels and beams, and serve over 100,000 simultaneous ATC callers (supporting over 3 million ATC subscribers in a single beam). Of course, if required, an integrated MSS/ATC operator could re-assign channels to MSS in full or in part.

The Terrestrial Carriers assert that there is no technical reason that separate operators can facilitate the ATC and MSS services. Even the most rudimentary analysis demonstrates that "separate operators" is not a practical, much less optimal, solution if a principal goal is to manage precious channel capacity.

Dynamically allocating capacity between MSS and ATC will require <u>simultaneous</u>, <u>real</u> <u>time</u> <u>knowledge</u> of the traffic volume and interference levels of both ATC and MSS segments as well as the current and predicted near-term locations of all Globalstar beams over CONUS. An integrated ATC/MSS system could use live noise floor measurements from the satellites themselves via the existing Gateway tracking antennas. Based on these measurements and knowledge of MSS traffic bandwidth requirements, a feedback loop to the ATC component could dynamically set frequency channels and traffic volumes, maximizing the number of ATC circuits while protecting the MSS circuits. This cannot be accomplished by two different operators cooperating to the utmost.

Operational Issues - Hard Hand Offs. Cingular/Sprint commented that dynamic frequency assignment may disrupt communication.[10] In fact, the specifications for each of

[10] <u>Cingular/Sprint Letter</u>, at 6.

the IS-95, cdma2000, QUALCOMM HDR, and Globalstar Air Interface standards provide for "hard hand-off" of CDMA calls. Hard hand-offs are implemented in today's IS-95 systems with no loss of communications or quality.

Globalstar would not attempt large-scale, system-wide, instantaneous frequency switching - nor would any sensible operator. As a satellite beam gradually migrated into an ATC cell site, its gain would gradually increase, as would its susceptibility to interference. The requirement to roll over frequencies is therefore not a step function, but a function of the rate of path gain change. ATC calls would be shed from one frequency and new calls initiated in the new frequency as the main beam came into the ATC site. In cases where the number of remaining ATC callers in the undesired frequency exceeded the desired limit, a predetermined number of hard handoffs would be executed, as provided for in the CDMA specifications, to meet the prevalent operating conditions.

Engineering Certification

I hereby certify under penalty of perjury that I am the technically qualified person responsible for the preparation of the engineering information contained in the foregoing Technical Statement; that I am familiar with the information contained therein; and that such information is true and correct to the best of my knowledge and belief.

Signed this 26th day of June 2002.

David E. Weinreich
Spectrum Manager
Globalstar, L.P.